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Introduction

In accordance with the City Auditor's 1999-2000 Audit Workplan, we have audited the San Jose-Santa Clara Water Pollution Control Plant's (WPCP) progress toward meeting effluent limitations. This is the third in a series of audits of the sewer services that the Environmental Services Department (ESD) provides. We conducted this audit in accordance with generally accepted government auditing standards and limited our work to those areas specified in the Scope and Methodology section of this report.

The City Auditor's Office thanks the ESD's Water Pollution Control and Watershed Protection Divisions for their time, information, and insight during the audit process.

Background

The cities of San Jose and Santa Clara jointly own and operate the San Jose/Santa Clara Water Pollution Control Plant (WPCP). Its regional service area covers approximately 300 square miles with a population of approximately 1.16 million that includes the cities of San Jose, Santa Clara, Milpitas, Cupertino, Campbell, Saratoga, Los Gatos, Monte Sereno and the adjacent unincorporated areas. These cities and areas are commonly called the tributary agencies (the "tributary agencies").

The WPCP was originally constructed in 1956 with a capacity of 36 million gallons per day (mgd). In 1959 the WPCP was expanded to a 54 mgd facility and the cities of San Jose and Santa Clara formed a partnership to own and operate the Plant. In 1964, the plant capacity was expanded to 94 mgd and the activated sludge secondary treatment process was added. Then, in 1968 and 1970, the capacity of primary and secondary treatment was expanded. In 1973, the City of Milpitas, which had previously operated its own plant, joined the consortium of partnership agencies. In 1979, WPCP began advanced tertiary treatment including nitrification, filtration, and chlorine disinfection. In 1986, the WPCP was expanded to its present size of 167 mgd. It is now the largest advanced wastewater treatment facility in California.

Located on an approximately 1,700 acre site in the Alviso area of San Jose and approximately six miles from the downtown

business district, the WPCP discharges treated effluent[1] to the Artesian Slough, which flows into the southern portion of San Francisco Bay. The WPCP operates pursuant to a National Pollutant Discharge Elimination System (NPDES) permit, which establishes regulatory limits and controls on the discharge of treated effluent. The Environmental Protection Agency (EPA), through the State Water Resources Control Board (State Board) and the California Regional Water Quality Control Board (Regional Board), issues an order that serves as the permit for a 4-year period.

Scope And Methodology

The scope of our audit was to determine if the ESD has (1) accurately measured effluent flow, (2) adequately analyzed or justified proposed diversion and/or conservation programs, and (3) accurately estimated or accumulated diversion program costs.

We met with WPCP staff to determine what controls exist to ensure the accuracy of effluent flow measurements. We reviewed dye-testing methods, preventive maintenance schedules and influent meter maintenance policies and procedures. We reviewed reporting requirements and performed a walkthrough of the effluent calculation. We also interviewed staff, toured the WPCP, and observed the effluent sampling process.

We met with diversion program staff to obtain an understanding of the current diversion programs and the status of each program. We compiled a history of the diversion issues and reviewed Treatment Plant Advisory Committee (TPAC) minutes and City Council memoranda related to diversion. We reviewed for compliance the diversion issues included in the NPDES permit. We verified reported South Bay Water Recycling Project (SBWRP) diversion numbers with information from the water retailers and reviewed customer demand listings. We also compiled costs related to each of the diversion programs.

[1] "Influent" is the flow into the WPCP. "Effluent" is the flow out of the WPCP.

Finding I

The ESD Needs To Ensure The Accuracy Of The Water Pollution Control Plant Meters That It Relies Upon To Report Critically Important Information To The San Jose City Council And The Regional Water Quality Control Board

In 1990, the California State Water Resources Control Board (State Board) ordered that the Water Pollution Control Plant (WPCP) implement actions to protect salt marshes in South San Francisco Bay from conversion caused by WPCP flows that exceed 120 million gallons per day (mgd) Average Dry Weather Effluent Flows (ADWEF)[2]. Should the WPCP fail to stay below the 120 mgd ADWEF limit the City of San Jose (City) could be required to implement an array of mitigating measures up to and including the suspension of issuing new building permits. As such, the amount of effluent WPCP staff reports to the California Regional Water Quality Control Board (Regional Board) and the San Jose City Council (City Council) is critically important for compliance and decision making purposes. However, we found that at no time since the Regional Board imposed the 120 mgd ADWEF limitation has WPCP staff been able to rely on effluent meters to report WPCP effluent flows. Instead, the staff has relied upon a variety of other WPCP meters to calculate effluent flows. Specifically we found that over the past four years, the WPCP has experienced significant problems with both its influent and effluent meters. As a result, WPCP staff subsequently had to correct reported effluent flows to the Regional Board.

WPCP staff installed new effluent meters in October 1999 and dye tested these meters for accuracy in April 2000. In our opinion, WPCP staff should report the results of its dye tests to the City Council and, based upon those test results, request funding for other types of effluent meters if necessary. By so doing, the City Council will have more reliable effluent flow information available to it when making multi-million dollar WPCP capital budget decisions.

[2] Average dry weather effluent flow is the lowest average flow rate for any 3 consecutive months between May and October.

The State Board Has Closely Monitored WPCP Effluent Flow Since 1990

In 1990, the Regional Board reported that between 1970 and 1985 increasing discharges of high quality, fresh water effluent from the WPCP had adversely affected a total of 381 acres of salt marsh in the South Bay. This conversion from salt-water marsh to fresh water marsh resulted in the loss of habitat of two endangered species – the California Clapper Rail and the Salt Marsh Harvest Mouse. The State Board ordered the Regional Board to order the WPCP to: (1) protect the marsh from further conversion caused by flows that exceed 120 mgd ADWEF[3] and (2) submit a mitigation proposal involving the creation or restoration of 380 acres of wetlands or equivalent habitat.

In 1991, the City on behalf of the WPCP and the tributary agencies proposed the South Bay Action Plan as a means of reducing the WPCP's effluent discharge below 120 mgd. The three main components of the 1991 Action Plan were to:

- Purchase and restore salt marsh properties equivalent to 380 acres to mitigate past conversion of salt marsh;
- Implement indoor water conservation programs to reduce influent flows to the plant by 15 mgd[4]; and
- Implement the South Bay Water Recycling Project (SBWRP) to reduce effluent discharged to the Bay during dry weather months.

Despite efforts to reduce flows, reported ADWEF had increased to an average of 132 mgd by 1996. Consequently, at a public hearing in December 1996, the Regional Board directed the WPCP and its tributary agencies to assess salt marsh conversion near the WPCP outfall in the spring of 1997 and to propose a revised Action Plan by June 1997.

The 1997 Revised Action Plan that the City proposed contained the following elements:

- Indoor water conservation and public education;

[3] The Regional Board measures the WPCP's dry weather effluent flow because the plants in the salt marshes near the discharge site need salt water to grow. During the winter, these plants are dormant and therefore, not affected by the inundation of fresh water caused by plant flows and heavy rains. During the dry weather months heavy discharge from the WPCP could affect the vegetation's ability to propagate, thereby converting the salt marsh to brackish marsh.

[4] The 1991 Action Plan committed to a 15 mgd water conservation program, with San Jose responsible for 12 mgd and the tributary agencies responsible for 3 mgd.

- Expanded water recycling;
- Industrial recycling and on-site reuse;
- Inflow and infiltration reduction;
- Environmental enhancement pilots; and
- Diversion of specified wastewater flows to the Sunnyvale Water Pollution Control Plant.

The Regional Board accepted the Revised Action Plan and issued permit Order No. 97-111 on September 17, 1997. The order also noted that the City would submit a tiered contingency plan of additional measures to be implemented if the Revised Action Plan did not achieve expected results. The contingency plan consists of the following tiers:

Tier I

If measures in the 1997 Revised Action Plan do not achieve expected reductions and the ADWEF exceeds 120 mgd during the 1998 ADWEF period or any subsequent year, the discharger will implement the following measures, unless the exceedence is determined to be due to factors beyond the discharger's reasonable control as determined by the Executive Officer of the Regional Board.

- Public Awareness Campaign – If flows in the Spring of 1998 show a high potential for exceeding 120 mgd during the 1998 ADWEF period, the discharger will implement a six-month public awareness campaign beginning in July 1998. The campaign will focus on increasing awareness and acceptance of the use of ultra low flush toilets (ULFTs) and the need for water conservation to reduce flows to the Plant. The campaign will also include information on the ordinances mandating conservation measures and any incentives available for implementing these measures.
- Mandatory Retrofit Upon Resale of Property – By ordinance, all residential, commercial, industrial, and institutional property owners within the tributary cities of the WPCP would be required to retrofit their bathrooms/lavatories with water saving fixtures upon sale of property. If enacted, this ordinance will be effective November 1, 1998.
- Mandatory Use of Recycled Water for Landscape – By ordinance, all new water customers within the recycled water service area with an annual non-potable water use

of 5 AF/yr[5] or more will be required to connect to the SBWRP system. In addition, all existing water customers within the recycled water service area with an annual non-potable water use of 5 AF/yr or more will be prohibited from using potable water for non-potable uses where recycled water is made available.

- Commercial/Industrial/Institutional Audit Requirements – By ordinance, authorize the Director (ESD or Tributary Authorities) the discretion to require flow audit studies from any company discharging to the Plant. The Director may also require the implementation of all cost effective flow-reduction measures, with cost effective defined as projects having a payback of five years or less. The requirement to perform a flow audit study would be phased. Under this Tier I element, the requirement would apply to companies discharging 100,000 gallons per day or more and would be effective November 1, 1998.

Tier II

If measures contained in the 1997 Revised Action Plan and Contingency Plan Tier I measures do not achieve expected reductions and the ADWEF exceeds 120 mgd during the 1999 ADWEF period or any subsequent year, the discharger will implement the following measures, unless the exceedence is determined to be due to factors beyond the discharger's reasonable control.

- Accelerated Implementation of Indoor Water Conservation – The projected budget for the 99/00 fiscal year is $4 million for the Water Efficiency Program. That budget would be increased to $7 million as a one-time measure to support an accelerated implementation of the conservation program elements. This accelerated effort would likely include a full-service residential ULFT program, wherein ULFTs are provided and installed by a discharger-selected contractor at a minimal cost to the customer. This fee would be waived for lower income or other targeted customers. An accelerated program would also likely include incentives for newer water-saving technologies, e.g., high-efficiency washing machines.
- Sewer Rates – review sewer fees to assess feasibility of levying surcharges to users with discharge volumes in

[5] AF/yr means acre feet per year.

excess of predetermined base levels. Also, investigate the feasibility of modifying sewer connection fees.

- Commercial/Industrial/Institutional Audit Requirements – The requirements in Tier I would be expanded to include companies discharging 50,000 gpd[6] or more.
- Regulate Cooling Tower Discharges – Develop and require by ordinance the use of reasonable control measures for companies using more than 10,000 gpd of potable water in their cooling towers. The reasonable control measures will include, but will not be limited to, the reuse of the company's wastewater and/or the use of recycled water in the cooling towers.

Tier III

If measures contained in the 1997 Revised Action Plan and Contingency Plan Tier I and II measures do not achieve expected reductions and the ADWEF exceeds 120 mgd during the 2000 ADWEF period or any subsequent year, the discharger will implement the following measures, unless the exceedence is due to factors beyond the discharger's reasonable control.

- Mandatory Retrofit with Time Limit – By ordinance, all residential, commercial, industrial and institutional property owners within the tributary cities of the Plant would be required to retrofit their bathrooms/lavatories with water saving fixtures. For multiple family dwelling properties, compliance is to be completed no later than December 31 of the year three years after the effective date of the ordinance. All other property types will have up to five years to attain compliance. The upon resale ordinance would continue to be effective.
- Commercial/Industrial/Institutional Audit Requirement – The requirements in Tier I would be expanded to include companies discharging more than 10,000 gpd.

Tier IV

If measures contained in the 1997 Revised Action Plan and Contingency Plan Tier I, II, and III measures do not achieve expected reductions and the ADWEF exceeds 120 mgd during the 2001 ADWEF period or any subsequent year, the discharger will implement the following measures, unless the exceedence is determined to be due to factors beyond the discharger's reasonable control.

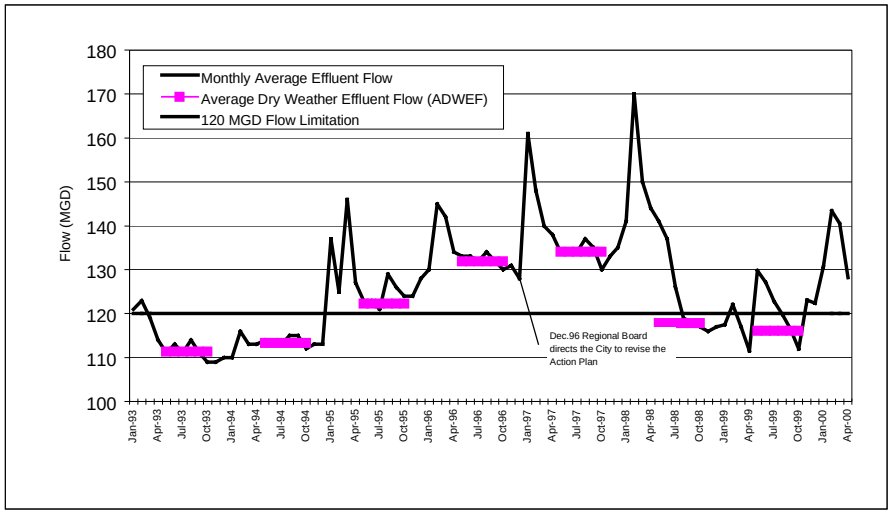
[6] gpd means gallons per day.

- Moratorium – For San Jose, pursuant to Municipal Code Part 2.75 entitled Monitoring Sewage Treatment Demands of Land Development and Suspension of Building Permits Under Certain Conditions, Section 15.12.424, issuance of building permits shall be denied, as City Manager shall determine that such action is necessary to meet discharge standards of the sanitary sewer system imposed by the Regional Board.

Regional Board Limitations On Effluent Flows

The WPCP operates pursuant to a National Pollutant Discharge Elimination System (NPDES) permit, which establishes regulatory limits and controls on the discharge of treated effluent. The WPCP reports its monthly effluent flows as part of its permit requirements. Exhibit 1 shows these effluent flows for the past 7 years.

Exhibit 1 WPCP Reported Average Monthly Effluent Flows From January 1993 Through December 1999 (Rounded To The Nearest MGD)



Source: WPCP Reports to the Regional Board.

According to WPCP's current NPDES permit,

> *If the 1998, or subsequent years, ADWEF exceeds 120 MGD, the Regional Board may hold a hearing to consider adoption of a permit amendment or enforcement Order imposing a limit of 120 MGD ADWEF.*

In other words, should the WPCP fail to stay below the 120 mgd ADWEF limit, the Regional Board could order the City to

take specific actions up to and including the imposition of a building moratorium, a measure which is included in the City's contingency plan. As such, the amount of effluent WPCP staff reports to the Regional Board and the San Jose City Council (City Council) is critically important for compliance and decision making purposes.

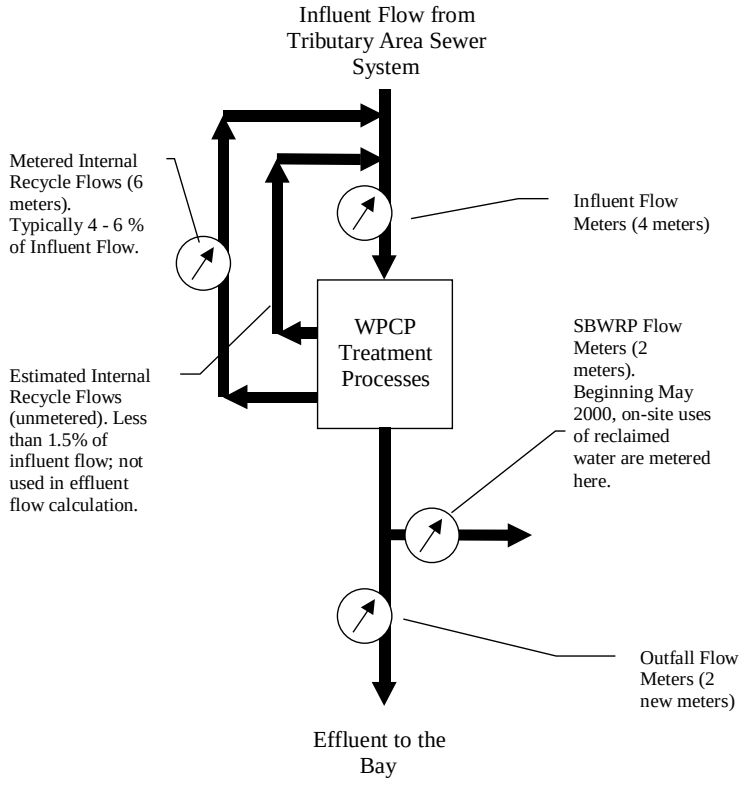
Effluent Flow Numbers Are Critically Important For Compliance and Decision-Making

Over the last ten years, reported ADWEF from the WPCP have driven several sizable capital investment decisions. For example, in 1996, reported ADWEF from the WPCP averaged 132 mgd and were far in excess of the limitations imposed in the 1993 permit. As a result, ESD staff recommended and the City Council adopted a revised South Bay Action Plan with a capital budget of approximately $150 million. This was in addition to the estimated $258.2 million cost of the 1991 Action Plan, for a total of $408.2 million.

For Reporting Purposes, The WPCP Calculates Effluent Flows Using Influent Meter Readings

The WPCP does not report metered effluent flows to the Regional Board. Instead, WPCP staff report calculated effluent flows. Specifically, WPCP staff compile metered influent flows (from the primary influent full-pipe magnetic flow meters), then adjust for a variety of internally recycled on-site purposes. Recycled flows are important in cases where flow is taken out downstream of the influent flow meter, used for some purpose (e.g., cleaning filters), and then is put back into the process upstream of the influent meter. As a result, calculating the amount of effluent without double-counting these recycled flows can be problematic. Exhibit 2 illustrates this process.

Exhibit 2 Simplified Diagram Of WPCP Wastewater Flows And Meters



According to ESD officials, the Regional Board does not stipulate whether effluent flows should be calculated or metered for reporting purposes.

WPCP Flow Meters

In the 1960s, the WPCP installed two influent meters to determine the volume of flow through the plant. In the 1970s, the WPCP installed two "pitot-mag" effluent meters to flow pace chlorine[7]. WPCP stopped using the effluent meters to flow pace chlorine in the late 1970s following the installation of new filter influent meters. By 1992, WPCP staff recognized that the influent meters were reaching the end of their useful life. In 1994, construction on the Headworks Redundancy project began. This four-phase, four-year project included a

[7] During the disinfection process, a specific dosage of chlorine per water volume is targeted. The amount of chlorine added is proportional to the flow rate, which means that as the water flow rate increases, chlorine is injected or paced at a faster rate to maintain the target dosage. To flow pace chlorine, staff needs to know the flow rate of the water at the chlorine injection point.

new bypass pipeline and influent metering system that would provide back-up to the old influent metering system.

In the summer of 1996, WPCP staff re-calibrated the old effluent meters using dye test results and placed them back in service. WPCP staff monitored the effluent meter readings but, unsure of the accuracy of the old meters, continued to report calculated effluent flow to the Regional Board. At that time, WPCP staff considered but did not recommend a two-year capital project proposal to install a full magnetic meter.

After The Influent Meter Failed The WPCP Had To Calculate Both Influent And Effluent Flows From March 1997 Through July 1998

In March 1997, while WPCP was in the midst of the Headworks Redundancy project, the old east primary influent magnetic meter failed, and staff determined that the old meter needed to be replaced. As a result, from March 1997 through July 1998, WPCP staff had to calculate both influent and effluent flows using a variety of other sub-metering systems meters within the WPCP including the old effluent meters. WPCP staff developed individual correction factors for each meter, and used those correction factors and meter readings to calculate both wastewater flows through the WPCP and effluent flows to the Bay.

During that same period, WPCP staff periodically re-tested meters to assess accuracy, adjusted correction factors, and re-calibrated meters as necessary. In July 1997, the WPCP staff rechecked the old effluent meters for accuracy.

Then, in September 1997, the effluent meters (which had been used to track calculated effluent flows) suddenly failed. Attempts to repair the meters were unsuccessful and staff took them off-line. From September 1997 through July 1998, WPCP staff only had the nitrification aerator influent meter and the filter influent meter to use as the basis for calculating WPCP effluent flow.

As construction on the new primary influent magnetic meters neared completion, WPCP staff was able to temporarily route wastewater flow through the new meters and get readings from the new meters. Staff used these readings to generate new correction factors for the nitrification aerator and the filter influent metering system. From October 1997 through July 1998 staff used these correction factors to calculate plant flows. According to WPCP staff, calculated flows prior to October 1997 were reasonable and tracked with later re-calibrated meter readings.

Effluent Flow Was Overestimated By 6 MGD In July 1998

Once WPCP staff placed the new east primary influent meter permanently online in July 1998, it determined that WPCP had overestimated effluent flow in July 1998 by about 6 mgd because of faulty readings from the old meters. In August 1998, an outside consultant dye-tested the new meter, determined it to be accurate, and staff corrected its reported effluent flows to the Regional Board for July 1998. WPCP staff did not address how much estimated flows prior to July 1998 were inaccurate.

Effluent Flows Were Understated By Approximately 20 Percent From May 1999 Through July 1999

In June 1999, WPCP staff discovered that the new influent meter readings were understated by about 22 percent. During the first quarter of 1999, staff had noticed monthly average flows were decreasing, which is highly unusual for that time of year. WPCP staff testing indicated that the meters were understating flows by about 20 percent. The meter manufacturer eventually determined that the sealant on the meter was defective. Following completion of the repair of the east meter, flow measurements increased immediately.

WPCP Has Had To Correct Six Monthly Reports To The Regional Board

As a result of the above metering problems, the WPCP has had to correct six monthly reports to the Regional Board. Exhibit 3 summarizes the corrections made to the Regional Board.

Exhibit 3 Summary Of Effluent Flow Corrections To The Regional Board

Date	Effluent Originally Reported To The Regional Board (MGDs)	Corrected Effluent Flows Reported To The Regional Board (MGDs)	Difference (MGDs)
July 1998	132.0	126.0	(6.0)
May 1999	104.9	129.8	24.9
June 1999	102.9	127.1	24.2
July 1999	98.9	122.8	23.9
August 1999	109.6	119.8	10.2
September 1999	115.3	116.6	1.3

New Ultrasonic Effluent Meters Are Being Installed And Tested

When WPCP staff placed the old effluent meters back in service in the summer of 1996, staff considered replacing the meters. As metering problems continued, WPCP staff continued discussions about meter alternatives. On the one hand, magnetic meters, which are considered more accurate in some situations, cost about $500,000 each, plus significant additional diversion and installation costs. On the other hand, ultrasonic meters would not require the effluent flow to be diverted during installation and are far less expensive at about $50,000 each.

In June 1999, WPCP staff recommended and the City Council approved the purchase of two new ultrasonic effluent meters for approximately $95,000. WPCP staff installed these meters in October 1999. Readings from these meters have been 5 to 6 mgd lower than the calculated effluent that WPCP staff had been reporting to the Regional Board.

The specifications for the new meters provide for dye-testing upon installation and quarterly for one year to ensure the meters are accurate. If WPCP staff find the meters to be inaccurate at any time, the vendor will be required to refund the purchase price. According to ESD officials, installation for these meters was completed in January 2000, and the meters were dye-tested on April 20, 2000. The WPCP is awaiting the final report from the consultant, and is planning a second test at the end of June, 2000.

According to WPCP staff, they will continue to report calculated effluent flow until they have dye-tested the new effluent meters for one year. However, due to the magnitude of proposed capital projects related to meeting the WPCP's 120 ADWEF mgd limitations, and the fact that these meters are currently reading lower than what the WPCP staff is reporting to the Regional Board, we recommend that the ESD:

Recommendation #1

Provide the City Council with quarterly reports on WPCP influent and effluent flows, and the status of the installation and testing of the new effluent flow meters.

Other Types Of Effluent Meters May Be Required To Provide Assurance That Reported Flows Are Accurate

Of the five other California jurisdictions we surveyed[8], three meter their effluent flows with magnetic meters. The other two jurisdictions calculate effluent flow using methods similar to San Jose. However, it should be noted that, unlike San Jose, neither of these two jurisdictions operate under ADWEF limitations. These other two jurisdictions meter the amount of influent (this is necessary for plant operations) and calculate the amount of effluent (this is necessary for reporting purposes). It is noteworthy that the Santa Rosa/Sonoma treatment plant, the only other jurisdiction operating under a flow limit similar to San Jose's, uses a magnetic meter to measure its effluent flow.

In the event that WPCP staff determines that the ultrasonic meters prove to be unreliable, then the WPCP should investigate other type of meters. For example, magnetic meters are more expensive, but are more reliable in some situations. Magnetic meters cost about $500,000 each with significant additional diversion and installation costs. Given the importance of accurate WPCP effluent flow measurements, we recommend that the ESD:

Recommendation #2

Ensure appropriate funding is available for the design and installation of other types of meters if the new ultrasonic meters do not prove to be accurate.

By so doing, WPCP staff will be able to install new effluent meter(s) as soon as possible, if that becomes necessary. Accurate effluent flow meters will 1) provide assurance that the City is or is not meeting its effluent reduction goals, 2) allow WPCP staff to report more accurate effluent flow information to the Regional Board, and 3) provide the City Council with better information when making multi-million dollar capital budget decisions.

CONCLUSION

The Regional Board has imposed ADWEF limitations on the WPCP. As a result of those limitations, staff recommended and the City Council adopted an ambitious $408.2 million capital program for flow reduction and diversion. The effluent flows that the WPCP reports to the Regional Board are calculations

[8] The five California jurisdictions we surveyed were Palo Alto, Sunnyvale, Napa, Santa Rosa/Sonoma, and Orange County.

based on metering equipment that has experienced multiple failures. The WPCP has installed new effluent meters but is not planning to report metered flows to the City Council or Regional Board until the meters have been tested for a full year. In our opinion, because of the importance of effluent flow numbers and their impact on projected capital expenditures, the ESD should: (1) provide the City Council with quarterly reports on influent and effluent flows, and the status of this installation and testing of the new effluent flow meters and (2) ensure appropriate funding is available for the design and installation of other types of meters if the new ultrasonic meters do not prove to be accurate. By so doing, the City will have additional assurance that it is or is not meeting its effluent reduction goals, WPCP staff will have additional assurance that it is reporting reliable effluent flow information to the Regional Board, and the City Council will be better informed when making multi-million dollar capital budget decisions.

RECOMMENDATIONS

We recommend that the ESD:

Recommendation #1 **Provide the City Council with quarterly reports on WPCP influent and effluent flows, and the status of the installation and testing of the new effluent flow meters. (Priority 3)**

Recommendation #2 **Ensure appropriate funding is available for the design and installation of other types of meters if the new ultrasonic meters do not prove to be accurate. (Priority 3)**

Finding II The ESD Has Significantly Overestimated Reclaimed Water Demand And Underestimated The Cost Of Its Water Reclamation Project

In 1991, the City of San Jose (City) submitted to the Regional Water Quality Control Board (Regional Board) a South Bay Action Plan (Action Plan). Part of the Action Plan was a water reclamation project. In December 1992, the City filed an update to the 1991 Action Plan with the Regional Board. The new Action Plan included a two-phase non-potable South Bay Water Recycling Project (SBWRP). The SBWRP was initially envisioned to supply 21.1 million gallons per day (mgd) of reclaimed water by late 1997, at a cost of $64 million. However, we found that:

- Phase I of the SBWRP has produced less than one third of its projected yield;
- The Environmental Services Department, (ESD) has significantly overestimated reclaimed water demand;
- The total construction cost of the SBWRP Phase I was more than double its originally envisioned cost; and
- The full cost of the SBWRP, including operations and maintenance (through 1999-00) and debt service is more than $256 million.

The ESD is currently considering plans to increase the amount of the SBWRP reclaimed water by 10 mgd to a total of 20 mgd to 25 mgd at a cost of $180 million. This would increase the total cost of the SBWRP to more than $436 million.

In our opinion, the ESD should provide the City Council with comprehensive Phase I SBWRP costs, benefits, and strategic planning information before the City Council commits additional resources to the SBWRP.

The South Bay Action Plan

In 1990, the California State Water Resources Control Board (State Board) ordered that the WPCP implement actions to protect salt marshes in the South San Francisco Bay from Water Pollution Control Plant (WPCP) average dry weather effluent flows (ADWEF) that exceed 120 mgd. In 1991, the City on behalf of the WPCP and the tributary agencies proposed the South Bay Action Plan as a means of reducing the WPCP's

effluent discharge below 120 mgd ADWEF. Water reclamation was one of the primary components of that proposal.

1991 Water Reclamation Proposal

The ESD originally proposed water reclamation as a joint project with the Santa Clara Valley Water District (SCVWD) and divided it into two projects, potable and non-potable. The non-potable reclamation project intended to recycle 9 to 10 mgd by mid-1996 for use in irrigation and industry in the Golden Triangle area (the area roughly bounded by Highways 101, 237 and I-880). This area was targeted due to the large landscaped and agricultural parcels located in close proximity to one another. The potable reclamation project would have a target utilization of 50-60 mgd and would include feasibility studies, construction of a pilot plan, and health effects studies.

In January 1992, the Water Reclamation proposals were redesigned as a result of a SCVWD operations study which estimated that less than 25 mgd of potable reclaimed water could be recharged over the long-term. Therefore, to maintain compliance with the Action Plan, which indicated a potential for 60 to 70 mgd to be reclaimed, the City conducted studies on expanded non-potable use. The City developed three non-potable water reclamation alternatives that are summarized in Exhibit 4.

Exhibit 4 Summary Of Non-Potable Water Reclamation Original Alternatives - January 1992

	Service Area	Estimated ADWEF[1] Demand	Estimated Capital Cost (In Millions)
Alternative 1	Golden Triangle	19.3 mgd	$60
Alternative 1A	Alternative 1 and extend service to Guadalupe Gardens and Guadalupe River Park	21.2 mgd[2]	$64
Alternative 2	Alternative 1A and oversize transmission lines to allow for future expanded service (Eastern Milpitas, Evergreen Valley and the Highways 87/85 area)	54.5 mgd	$69[3]

[1] Average dry weather effluent flow is the lowest average flow rate for any 3 consecutive months between May and October.

[2] According to ESD staff, this number was subsequently rounded down to 21.1 mgd.

[3] Alternative 2 includes costs to oversize facilities within the Golden Triangle study area, but does not include facilities outside that area.

1992 Revised Water Reclamation Proposal Was To Supply 21.1 MGD In Phase I And A Total Of 45.4 MGD By The End Of Phase II

In December 1992, the City filed an update to the 1991 Action Plan with the Regional Board revising the magnitudes of the non-potable and potable water reclamation projects and the project deadlines. The revised Action Plan included a two-phase non-potable water reclamation project designed to supply 40 to 45 mgd ADWEF.

- Phase I, the Golden Triangle, with a capacity of 21.1 mgd ADWEF was to be operational by late 1997 and
- Phase II, the expanded service area, was to increase the total capacity of the system to 45 - 50 mgd ADWEF by late 2000.

These changes were reflected in the Regional Board's permit No. 93-117.

In 1993, The City Decided To Proceed With Water Reclamation Independent Of The Santa Clara Valley Water District

Cost sharing negotiations between the WPCP and the SCVWD resulted in two cost sharing alternatives for funding the non-potable water reclamation project - co-ventured and independent.

Co-Ventured

- Water District becomes wholesaler;
- Water District receives 100 percent of revenue from sale of reclaimed water;
- Water District contributes $355 per acre foot of reclaimed water delivered or a minimum of $3.2 million annually towards capital project costs, whichever is greater;
- Operation and maintenance expense for distribution - Water District 81 percent; retailers 15 percent; WPCP 4 percent; and
- Grants are shared in proportion to capital contribution – estimated 55 percent WPCP; 45 percent Water District.

Independent

- WPCP becomes wholesaler;
- 100 percent of revenue from the sale of reclaimed water is applied to the capital project cost;
- Water District contributes $93 per acre foot of reclaimed water delivered for 25 years to help defray capital and operating expenses;
- Grants are shared in proportion to capital contribution - estimated 90 percent WPCP; 10 percent Water District; and
- Operation and maintenance cost expense for distribution - WPCP 85 percent; retailers 15 percent.

City staff reviewed and analyzed both alternatives and found the independent project to be the most economically attractive because it would provide the WPCP with a revenue stream that would offset the costs incurred in developing the project. In June 1993, the City Council approved the adoption of a resolution authorizing an independent non-potable Reclamation project.

1993 Estimated Non-Potable Water Reclamation Costs Increased To $423 Million

By the time the 1993 non-potable water reclamation facilities plan was completed and approved, cost estimates for the 3-phased non-potable project had increased to $423 million including preliminary engineering. According to the 1994-95 Capital Budget:

- Phase I would construct more than 50 miles of pipeline and provide 17 mgd of reclaimed water (ADWEF) to the Golden Triangle area, at a cost of $130 million.
- Phase II, at a cost of roughly $220 million, would increase the capacity of the system by 33 mgd to a total of 50 mgd ADWEF.
- Once Phase II infrastructure was in place, an additional 20 mgd could be obtained in Phase III at an additional cost of $50 million.

Phases 2 and 3 would construct an additional 220 miles of pipeline and expand the distribution systems to South San Jose and the cities of Campbell, Cupertino, Saratoga, Los Gatos and Monte Sereno.

According to the 1994-95 Capital Budget, the projected cost increases from $133 million to $350 million for Phase I and II were due primarily to the following:

- Previous estimates for Phase I did not include either the cost of: (1) distribution piping needed to bring non-potable lines from central areas to individual customers or (2) connecting non-potable service to customer systems. Staff had anticipated that customers or retailers would assume some of these costs. In addition, the proposed diversion structure and reclamation pump station facilities were re-sized from 50 mgd capacity to 70 mgd capacity[9]. These changes added approximately $50 million to the cost of Phase I.
- City staff redesigned the distribution pipeline system in order to reach the highest demand users. Originally, staff identified CalTrans as a major customer, which would use reclaimed water to irrigate miles of median strips. However, CalTrans subsequently determined that the reclaimed water pipelines could not be located in their median strips because they would conflict with

[9] Phase III, which would have taken capacity up to 70 mgd was dropped in 1995-96. Therefore, capacity remains at 50 mgd.

highway structural sections. Furthermore, a market assessment study revealed that although the potential demand for reclaimed water was larger than previously thought, customers were distributed throughout the service area at a relatively low density. As a result, a more extensive distribution system would be required. These alignment and layout changes added approximately $100 million to the cost of Phase II.

- The market assessment also identified an additional 20 mgd of potential demand using Phase II infrastructure. Staff estimated the cost to reach this additional market was $50 million.

Deferral Of Potable Water Reclamation

As the water reclamation project moved forward, the Treatment Plant Advisory Committee[10] (TPAC) debated the issue of non-potable versus potable use. Apparently, the cost for both projects were comparable, but some TPAC members felt the potable process was a better use of money. The potable process would involve building a reverse osmosis water treatment facility to purify the reclaimed water, and then piping the purified water to reservoirs for groundwater recharge. The identified advantages were (1) not having to build a redundant water distribution pipeline and therefore, not having to dig up City streets, and (2) developing a potable water supply with unlimited use. The downside to a potable project was the time constraint. TPAC concluded that due to the timeline included in the Action Plan, a potable project would jeopardize the City's ability to meet the permit requirements.

1994 Redesign To Maximize Projected Usage

In October 1994, a value engineering review identified an insufficient demand within the Golden Triangle to meet the 21.1 mgd goal specified in the South Bay Action Plan. The review recommended that the City redesign pipelines to serve significant customers with higher projected water demands, and expand the project service area to include Central and South San Jose. According to the team of engineers who performed the review, this revision offered two key advantages:

- The revised design provided recycled water service to more major customers, ensuring more cost-effective

[10] The Treatment Plant Advisory Committee was created in 1959. The powers and duties of TPAC are to tender its advice with respect to any and all matters relating to the treatment plant and its maintenance, repair, expenses, replacement, improvement and operation, and policies relative thereto. TPAC meets monthly and the nine voting members are from San Jose, Santa Clara and tributary agencies.

delivery and fewer operational problems associated with numerous dead-ended pipelines and

- By constructing one larger pipeline to serve as a "backbone" for the recycled water system, the agencies could serve water to larger water customers in south San Jose and conceivably could eventually supply water to a potable plant located adjacent to Anderson Reservoir as well.

Phase III Dropped

The 1995-96 Capital Budget increased the cost estimate of Phase I by $11 million to $141 million and Phase II by $110 million to $330 million. The Administration dropped Phase III as part of the non-potable project because the Regional Board did not require it and it would only be implemented if it represented a cost-effective water supply alternative or was required to prevent further marsh conversion.

The 1995-96 Capital Budget noted that although studies performed in 1990 indicated that potable reuse was not economically feasible, the high cost of implementing Phase II suggested that potable reuse should be reconsidered as a cost effective alternative to achieve the Regional Board's diversion mandates.

SBWRP Phase I Has Produced Less Than One Third Of Its Projected Yield

From October 1997 to January 2000, the SBWRP has never averaged more than 8.8 mgd diversion in any month and has averaged less than 6.2 mgd of diverted ADWEF. This is less than one third of the projected yield of 21.1 ADWEF. The following exhibit illustrates the average monthly recycled water flow since the SBWRP began distributing water.

Exhibit 5 South Bay Water Recycling Average Daily Flow October 1997 Through January 2000

Month	Total Metered Flow (Millions Of Gallons)	Number Of Days	Average Daily Flow (MGD)
October 1997	0	3	0
November 1997	0	30	0
December 1997	0.90	31	.03
January 1998	0	31	0
February 1998	0	28	0
March 1998	0.40	31	.01
April 1998	4.80	30	.16
May 1998	12.40	31	.40
June 1998	41.10	30	1.37
July 1998	73.20	31	2.36
August 1998	125.00	31	4.03
September 1998	120.70	30	4.02
October 1998	86.68	31	2.80
November 1998	23.82	30	.79
December 1998	15.19	31	.49
January 1999	14.61	31	.47
February 1999	9.20	28	.33
March 1999	14.07	31	.45
April 1999	44.26	30	1.48
May 1999	105.85	31	3.41
June 1999	135.27	30	4.51
July 1999	198.13	31	6.39
August 1999*	209.72	31	6.77
September 1999*	212.41	30	7.08
October 1999*	272.68	31	8.80
November 1999	51.98	30	1.73
December 1999	45.21	31	1.46
January 2000	40.13	31	1.29

* It should be noted that from August 1999 through October 1999, water cannons were used to irrigate the fields surrounding the plant. Beginning the last two days of August through October 1999, staff also filled the storage lagoons with reclaimed water to keep effluent flows down until the dry weather season ended. These actions consumed up to 1.65 mgd of reported SBWRP flow.

According to the ESD staff, they have encountered two major obstacles to hitting their diversion goal of 21.1 mgd, which staff reduced to only 15 mgd around September 1996:

1. Changing land use and agricultural land conversion – Milpitas used to have much more agricultural land but as this land was developed, the demand for reclaimed water decreased[11].

2. Weather – Cool 1999 summer temperatures have reduced evapotranspiration[12], thereby, reducing the demand for reclaimed water for landscaping and irrigation.

It should be noted that in March 1994, the ESD reported to the Council that

> *"Treated effluent from the SJ/SC WPCP has been recycled on a limited basis for many years…a small percent of flow (up to 5 mgd) has been recycled for cooling water and irrigation of plant landscaping…Since 1989, the City has dispensed more than 300 million gallons for construction purposes, and an additional 1 mgd has been piped to a nearby golf course for irrigation."*

We reviewed the current customer list and the start date for each customer and found that before the SBWRP began, there were 14 existing customers in Santa Clara with a demand of approximately 1 mgd. When reclaimed water deliveries started in November 1997, 13 of the 15 customers that purchased water in the first quarter of operations, were already receiving recycled water. The two new customers were located in close proximity to the existing Santa Clara pipeline. In other words, up to 1 mgd in reclaimed water would have been diverted even if the SBWRP had never been built.

[11] According to TPAC minutes, staff had already considered changing land use when identifying demand in 1996.

[12] Evapotranspiration is the loss of water from the soil both by evaporation and by transpiration from the plants growing thereon. Transpiration is the passage of water vapor from a living body through a membrane or pores.

ESD Has Significantly Overestimated Reclaimed Water Demand

A March 1995 update of the non-potable reclamation project to the Regional Board indicated that construction would begin in April 1996 with a Phase I budget of $130 million and a Phase II budget of $330 million. At that time, the WPCP had identified 50 potential customers with average day maximum month demand of 18.91 mgd.

In May 1996, Phase I construction began. The 1996 SBWRP first quarter update noted that the SBWRP was on schedule to be completed by the end of 1997 and would provide recycled water to over 300 customers. Staff estimated that City of San Jose facilities would consume 18 percent of the total recycled water flow, other public sites 19 percent, business parks 7 percent, and private land owners would use the remaining 56 percent. The update also noted that customers had committed to over 70 percent of the projected 21.1 mgd.

It should be noted that around September 1996, staff reduced diversion goals to the point where a system that at one time was supposed to supply 21.1 mgd was now projected to supply 15 mgd at some time in the future.

A September 1996 SBWRP Customer Status Report noted that staff had identified more than 200 customers, who were to receive an estimated 14 mgd of high-quality recycled water. According to the report, the SBWRP would underwrite the cost of retrofitting these customers' facilities through a $7 million grant program. Staff evaluated 30 of the largest users and 17 City sites for retrofit construction. The report stated, "to reach the total program goal of 21 mgd, additional customers will be added in the future years as funds are available".

Phase I facilities include a diversion structure, transmission pump station, two remote booster pump stations, one reservoir and 60 miles of distribution pipeline. In October 1997, the transmission pump station and 20 miles of pipeline became operational. By July 1998, pipeline segments were complete and connected to the system and 73 sites were connected to the system. However, June 1998 projections revealed that diversion for the 1998 irrigation season would only reach 12 mgd[13], well below the original 21.1 mgd diversion goal. According to staff, this was due to the unseasonable wet Spring weather.

[13] Actual diversion peaked at only 4 mgd, not the 12 mgd reported.

The SBWRP status report for the fourth quarter of 1998 indicated that as a result of the SBWRP diversion, the WPCP was able to reduce ADWEF below 120 mgd for the first time in 5 years. The report failed to mention that most of the reported reduction in ADWEF occurred because WPCP staff installed new influent meters in July 1998. These new meters revealed that the ADWEF the WPCP previously reported was overstated by 6 mgd. Thus the SBWRP was not the only reason the ADWEF was reduced below 120 mgd. (See page 12 for a discussion of this issue).

According to the Third Quarter 1999 Status Report for the SBWRP, during the 1999 irrigation season, there were 215 customers connected to the SBWRP system. Our review of the SBWRP list of 215 customers as of the fourth quarter of 1999 revealed that only 146 had ever purchased SBWRP water. We also found that of these 146 customers, 107 had a cumulative demand of approximately 1 mgd ADWEF of reclaimed water for irrigation or landscaping needs.

In August 1999 Peak Average Monthly Reclaimed Water Usage Reported By SBWRP Retailers Was Only 5.34 MGD

Our analysis of SBWRP retailers' water usage records from April 1999 to December 1999 revealed peak average monthly reclaimed water usage of 5.34 mgd in August 1999. SBWRP records indicate peak average reclaimed water usage of 6.99 mgd in August 1999. It appears the WPCP used up to 1.65 mgd on-site. Specifically, we observed water cannons irrigating the fallow agricultural fields adjacent to the WPCP. In addition, beginning the last two days of August 1999, staff began filling the storage lagoons near the WPCP with reclaimed water.

Exhibit 6 shows SBWRP deliveries by retailer.

Exhibit 6 SBWRP Water Usage By Retailers (In MGD) From April 1999 To December 1999[14]

	San Jose Water Company	Muni Water	Santa Clara	Milpitas	Total
Mar 99	0.06	0.20	0.49	0.06	0.80
April 99	0.91	0.19	1.08	0.24	2.41
May 99	1.13	0.20	1.24	0.24	2.81
June 99	1.75	0.67	1.32	0.68	4.43
July 99	1.77	0.67	1.18	0.68	4.31
Aug 99	**2.44**	**0.69**	**1.47**	**0.74**	**5.34**
Sep 99	0.87	0.45	1.05	0.71	3.09
Oct 99	0.40	0.47	0.78	0.48	2.13
Nov 99	0.22	0.45	0.44	0.46	1.58

Source: San Jose Water Company, San Jose Municipal Water System, City of Milpitas, City of Santa Clara

According to staff, SBWRP water sales revenue from July 1997 through September 1999 totaled $679,450.

The Total Construction Cost Of The SBWRP Was More Than Double Its Originally Envisioned Cost

The SBWRP has evolved over the past eight years from a $64 million concept to divert 21.2 mgd (ADWEF) to a $141 million project that only delivered 6.2 ADWEF in 1999 to customers. Exhibit 7 shows the history of Phase I non-potable water reclamation capital cost estimates from 1992 through 1999.

Exhibit 7 SBWRP Phase I Capital Cost Estimates 1992 Through 1999

Date	Source of Estimate	Estimated Cost
January 1992	Consultant Report presented to TPAC: Golden Triangle Non-potable Reclamation Project Facility Plan	$63,513,000
June 1992	1992-93 Capital Budget – Original Budget	$90,284,000
June 1993	1993-94 Capital Budget	$89,894,000
June 1994	1994-95 Capital Budget	$130,000,000
June 1995	1995-96 Capital Budget	$141,000,000
June 1996	1996-97 Capital Budget	$140,000,000
January 1999	Final Capital Cost	$140,750,000

[14] Numbers may be off due to differences in meter-reading cycles.

Phase I of SBWRP was completed in January 1999 at a total cost of approximately $140,750,000 - more than double the original projected cost.

The Cost Of The SBWRP, Including Operations And Maintenance (Through 1999-00) And Debt Service Is More Than $256 Million

It should be noted that the $140.8 million noted above only accounts for the capital design and construction costs for Phase I of the SBWRP. The $140.8 million does not include costs for administration (staff time), feasibility studies, annual operating and maintenance expenditures, debt service, and community outreach. We estimate SBWRP costs to date:

- Phase I capital design and construction costs - $140.8 million;
- Deferred pipeline projects - $7.7 million[15];
- Estimated Phase I debt service - $95.8 million;[16]
- Estimated Phase I administration (staff costs) - $3.2 million;[17]
- Estimated Phase I feasibility studies – At least $5 million. According to a March 28, 1994 Water Reclamation Update, *"Since its development in concept five years ago, nearly $5 million of local money has been spent on technical reports, market assessments and facility design"*;
- Estimated Operating and Maintenance – Approximately $3.5 million ($1.3 million per year)[18]; and
- Estimated Community Outreach – At least $793,000, excludes personal services[19].

Therefore, we estimate the full cost for Phase I of the SBWRP at more than $256 million.

[15] Expenditures as of May 31, 2000, out of $16 million budgeted.

[16] 1997 Revised Action Plan.

[17] Represents staff administrative costs for 1996-97, 1997-98, 1998-99 and 1999-2000 up to February 29, 2000. It should be noted that this program began in 1994-95; however, costs prior to 1996-97 were not available.

[18] Estimate includes 1997-98 (8 months), 1998-99, and 1999-2000.

[19] SBWRP outreach totaled $152,000 in 1998-99; $265,000 in 1997-98; and $376,000 in 1996-97.

Benefits Of The SBWRP

In Appendix B, the ESD informs us of the economic and environmental benefits of the SBWRP. According to ESD,

- Due to financial and technical constraints, no single option can reduce Plant discharge to the Bay enough to avoid a building moratorium or protect wildlife habitat for endangered species. A mix of components is required. Although it is capital-intensive and consequently has a higher cost per volume diverted, South Bay Water Recycling was selected because, in addition to the diversion of effluent flow, it offers a range of other benefits for the South Bay's economy and ecology.
- The pump stations and distribution pipelines that form the backbone of the recycled water system were sized to meet the growing demand for recycled water for the next 50 years. Additional lateral piping and pumping facilities can be added to the transmission pipelines as the customer base expands.
- SBWRP supports implementation of San Jose General Plan 2020 and the continued vitality of our local economy by providing a reliable supply of water appropriate for most industrial purposes. In addition, recycled water is priced to cost less than potable water.
- Recycled water represents a new locally controlled water supply not susceptible to state or federal cutbacks or price increases. By investing in recycled water, the community avoids the cost of other more expensive water supply projects, such as building or expanding reservoirs. During drought cycles, recycled water will provide a cushion, preventing the loss of valuable landscaping.
- Even small amounts of certain trace metals and salts discharged to the Bay are harmful to the aquatic environment. However, the same metals and salts applied to crops or landscaping in recycled water can stimulate plant growth.
- Reusing wastewater from the Plant for irrigation and industrial purposes helps protect the Sacramento-San Joaquin River Delta by reducing withdrawals of fresh water imported by our community.
- Recycled water represents a potential new source of water available for use in the environment for restoring urban streams or creating wetlands.

The ESD Is Considering Plans To Spend An Additional $180 Million On The SBWRP To Produce An Additional 10 MGD Of Diversion

The City is considering plans for near-term and long-term expansion of the SBWRP system. The near-term plans are designed to increase demand by 10 mgd over the next six years, while long-term plans identify strategies to reuse an additional 50 mgd during the dry weather season. The near-term projects, described in a March 9, 2000, memorandum to the Treatment Plant Advisory Committee, would expand the recycled water distribution system within San Jose, Santa Clara and Milpitas and include construction of 57 miles of pipeline and 3 reservoirs to reach 219 customers. These projects will increase demands, provide looping capabilities, improve reliability and facilitate system operation and maintenance at a projected cost of $180 million. In February 2000, $20 million was allocated to Santa Clara and Milpitas to begin design and construction of the initial elements of the near-term system expansion.

According to the March 9, 2000, memorandum, long-term alternatives for further development include export to agricultural markets outside of Santa Clara Valley, environmental enhancement, and indirect potable reuse. A flexible strategy was recommended, which would allow various components to be implemented as determined by community need and refined over time. A report and recommendations for near-term and long-term SBWRP system expansion is expected to be released to the City Council this spring following environmental review.

If this projected $180 million in capital cost were to be added to the $256 million shown above, the full cost of the SBWRP would be more than $436 million. For this expenditure, the SBWRP would produce only 20 to 25 mgd of diversion. This equates to a cost of $17 to $21 million per mgd. If only capital costs were considered, this would still equate to a cost of $13 to $16 million per mgd. The project as originally budgeted in 1992-93 equated to a cost of about $4 million per mgd.[20]

[20] $90.3 million budgeted to produce 21.1 in diversion.

Comprehensive Phase I Information Is Critical Before The City Council Commits Additional Resources To Phase II Of The SBWRP

The SBWRP is accounted for in four of the twelve Wastewater Treatment System Enterprise Funds that the City uses to account for the financing, construction, and operation of the sewer system and the WPCP. According to the City's Comprehensive Annual Financial Report, the City uses enterprise funds "to account for operations that are financed and operated in a manner similar to private business enterprise. . ." As such, the City should operate the SBWRP in a business-like manner. Good business principles prescribe that management track sales, other revenues, and expenditures.

However, we found that four different employees track different aspects of SBWRP capital, operating, and maintenance costs, and no one routinely summarizes the different information. In our opinion, such summarized cost and revenue information would improve the City's ability to operate the SBWRP in a manner more like a private business enterprise.

SBWRP Phase II And Masterplan

The 1997 Revised Action Plan proposed two projects related to the SBWRP: (1) Deferred and Infill Projects and (2) the Southern Alignment and Agricultural extension of the SBWRP system. According to the Revised Action Plan, the projects would provide an additional 15 mgd total diversion beyond the original Phase I diversion goal of 21 mgd, for a total diversion of 36 mgd. The Revised Action Plan describes the two projects as follows:

Deferred And Infill Projects

There are two aspects of the Deferred and Infill Projects which were originally expected to divert a total of 5 mgd at an estimated cost of approximately $20 million. So far, $12 million has been budgeted and of that, $10.9 million has been encumbered.

- Deferred Projects - relate to the construction of pipeline segments originally included in Phase I that were not constructed in order to remain within the available budget. Deferral of certain segments allowed the City to complete the reaches of Phase I that provided the greatest benefit in the least amount of time.
- Infill Projects - refers to connecting additional customers within the service area of the existing Phase I pipeline. The original Phase I budget did not include funding for infill projects because staff assumed

reclaimed water customers would pay for some of the cost to hook up to the SBWRP system.

Southern Alignment And Agricultural Extension To Coyote Valley

- Southern Alignment - Nearly 40 large water customers could potentially be reached by extending the Phase I pipeline from the end of Capital Expressway and Senter Road, southward along Capital Expressway and Snell Avenue to Santa Teresa Boulevard, then easterly on Santa Teresa to Bailey. This project consists of 10 miles of pipe at an estimated cost of $60 million and would divert 5 mgd. This segment would also connect the SBWRP transmission system to higher-use agricultural customers in south San Jose.
- Agricultural Extension - Following the Southern Alignment Expansion, an additional extension along Bailey to Monterey Highway and southward could provide up to 5 mgd of diversion to large customers in the northern Coyote Valley, primarily for agricultural use. Construction of five miles of pipeline and a booster pump station is estimated to cost an additional $30 million. Some obstacles to implementation of this component include continuation of the sizable subsidy the Santa Clara Valley Water District (SCVWD) currently provides to area growers. Agricultural production is currently supported through pricing discounts of up to 95 percent. Also, the safety of this alternative water supply for all agricultural markets must be demonstrated.

The SBWRP Phase II expansion program was initiated in 1997-98. The goal of the Phase II program has been to plan, design and construct facilities to reuse an additional 15 mgd by 2005. A parallel effort is underway to create a South Bay Water Recycling Master Plan to reuse 100 mgd by 2020.

According to the July 1999 Clean Bay Strategy, the SBWRP southern and agricultural extensions to the Coyote Valley are expected to be under construction by January 2001. In addition, current objectives are to:

- Prepare a masterplan for the non-potable distribution system;
- Increase recycled water deliveries to 30 mgd by 2005; and

- Identify long term strategies for up to 100 mgd of reuse by 2020.

This effort is being implemented through a resource partnership, which includes the cities of San Jose, Santa Clara and Milpitas, five wastewater tributary agencies, five water retailers, SCVWD and the U.S. Bureau of Reclamation. The SCVWD has contributed $715,000 towards the master planning effort. To date, the ESD has:

- Conducted feasibility studies regarding the expansion of the SBWRP to deliver recycled water to additional customers within the existing service area and in Coyote Valley, as well as to industrial customers in Alameda County and agricultural customers in San Benito and Monterey Counties.
- Held a number of technical workshops to assess the potential for potable reuse through groundwater recharge and reservoir augmentation.

The 1997 Plan noted that "subsequent revisions to the Action Plan will be required to address flow increases as growth and development continue in the Santa Clara Valley, as determined by local general plans." It should be noted that if Phase I of the SBWRP reached its targeted diversion goal of 21 mgd, Phase II would not be mandated. This is because based on current flow estimates, if the SBWRP diverted 21 mgd, the WPCP would be well under the 120 mgd trigger point. However, the current 8.8 mgd in maximum diversion is not sufficient to keep the WPCP under the 120 mgd of discharged effluent. As the City grows, even 21.1 mgd ADWEF may not be sufficient. As a result, the City should examine the reasons for the relatively low reclaimed water usage to date. In addition, the ESD should update its original economic analysis of this project. Such a process would provide the City Council with additional information that it should have before committing additional funds to the SBWRP. Therefore, we recommend that the ESD:

Recommendation #3

Provide the City Council with comprehensive historical and current information regarding SBWRP capital and operating costs, revenue, actual and projected benefits, and an updated economic analysis as part of the master plan process.

CONCLUSION

The SBWRP has provided less than one-third of its projected yield at more than double its originally envisioned cost. In our opinion, the ESD needs to apply good business principles to the SBWRP and provide the City Council with comprehensive historical and current cost/benefit information for policy making and capital project budgeting purposes.

RECOMMENDATIONS

We recommend that the ESD:

Recommendation #3

Provide the City Council with comprehensive historical and current information regarding SBWRP capital and operating costs, revenue, actual and projected benefits, and an updated economic analysis as part of the master plan process. (Priority 3)

Finding III The ESD Should Provide The City Council With Cost-Benefit Information Regarding Long-Range South Bay Action Plan Alternatives Before Proceeding With The Expansion Of The South Bay Water Reclamation Project

In 1991, the San Jose-Santa Clara Water Pollution Control Plant (WPCP) developed the South Bay Action Plan to address environmental and regulatory concerns about its effluent flows into the South San Francisco Bay. As revised in 1997, the South Bay Action Plan outlines substantial future projects at considerable cost to the WPCP users. The bulk of that cost is related to the South Bay Water Recycling Project (SBWRP) which has so far been the least cost beneficial of numerous other alternatives that are available to reduce WPCP effluent flows to San Francisco Bay. This spring, the ESD will release a report and recommendation for expansion of the SBWRP to the City Council. In our opinion, the ESD should provide the City Council complete and accurate cost-benefit information regarding long-range South Bay Action Plan alternatives before proceeding with the expansion of the SBWRP.

The South Bay Action Plan

In 1990, the California State Water Resources Control Board (State Board) reported that between 1970 and 1985, a total of 381 acres of salt marsh in the South Bay had been affected as a result of increasing discharges of high-quality but fresh water effluent from the WPCP. This conversion to brackish or fresh water marsh, and consequent loss of habitat, affects two endangered species, the California Clapper Rail and the Salt Marsh Harvest Mouse. The State Board ordered that (1) the Regional Board enforce an order preventing flow increases above 120 million gallons per day (mgd) average dry weather effluent flow (ADWEF)[21] and (2) the City submit a mitigation proposal involving the creation or restoration of 380 acres of wetlands or equivalent habitat.

[21] Average dry weather effluent flow is the lowest average flow rate for any 3 consecutive months between May and October.

As an alternative to the State Board's flow limitation, the City of San Jose worked with the California Regional Water Quality Control Board (Regional Board), U.S. Fish and Wildlife Service, California Department of Fish and Game, and key environmental groups to develop an Action Plan to achieve the intent of the State Board order. The result was the 1991 South Bay Action Plan, which incorporated wetlands mitigation, indoor water conservation and water reclamation.

Despite efforts to reduce flows, average dry weather effluent flows (ADWEF) had increased to an average of 132 mgd by 1996. Consequently, at a public hearing in December 1996, the Regional Board directed the WPCP and its tributary agencies to assess salt marsh conversion near the WPCP outfall in the spring of 1997 and to propose a Revised Action Plan by June 1997.

The Regional Board accepted the Revised Action Plan and issued permit Order No. 97-111 on September 17, 1997. The order also noted that the City would submit a tiered contingency plan of additional measures to be implemented on November 1, 1998 if the measures contained in the Revised Action Plan do not achieve expected Average Dry Weather Effluent Flow (ADWEF) reductions and exceeds 120 mgd during the 1998 ADWEF period. At a minimum the contingency plan would have to include the establishment of local ordinances to require additional water conservation and recycling efforts, economic incentives, and accelerated implementation of the Revised Action Plan.

Elements Of The South Bay Action Plan

The 1997 Proposed Revision to the South Bay Action Plan contained the following interim projects, designed to reduce discharge flows by up to 7 mgd in 1997-98:

- Public Education: This program, as outlined in the Revised South Bay Action Plan was to provide increased residential public awareness on Ultra Low Flow Toilets (ULFT) and the need for continuous water conservation. It was scheduled to begin immediately in order to help reduce flows in the near term.
- On-site Reuse: On-site reuse was to reduce discharge by diverting approximately 0.8 mgd to irrigate a portion of the 350 acres of agricultural land the WPCP controlled. It should be noted, that the SBWRP has counted this diversion among its accomplishments.
- Sunnyvale Diversion: The proposed Sunnyvale diversion project was projected to reduce influent flow to the WPCP

by diverting up to 4.5 mgd of untreated wastewater from Cupertino and up to 1 mgd from a major industrial company to the Sunnyvale Water Pollution Control Plant. ESD estimated the cost of this project at about $2.8 million per year for five years. A July 27, 1998 memorandum to the Treatment Plant Advisory Committee[22] (TPAC), compared the cost per mgd diverted from this project to the Infill and Infiltration Reduction (I&I) project[23], finding that it was more cost effective to expand the I&I project.

The 1997 Proposed Revision to the South Bay Action Plan also included several alternatives in addition to the completion of Phase I SBWRP facilities already under construction. Exhibit 8 shows these alternatives.

Exhibit 8 Revised Action Plan 1997-2000 Alternatives

Project	Cost In Millions	Projected Diversion (MGD)	Cost (In Millions) Per MGD Diverted
Indoor Water Conservation	$22 to $25	5 – 8	$3.1 - $3.8
Expanded Water Recycling	$100	15	$6.6
Industrial Water Recycling/Reuse	$5	2 – 4	$1.2 - $2.5
Inflow/Infiltration Reduction	$16.1	8	$2
Environmental Enhancement Pilots	$6.4	26	$0.8
Total	$149 to $153	56 - 61	$2.4 - $2.8

SOURCE: South Bay Action Plan Proposed Revision – June 1997

Indoor Water Conservation

This program originally started in 1986 as part of the Flow-Reduction Strategy and was incorporated into the original Action Plan in 1991. In 1997 the City expanded this program into the rest of the WPCP tributary area as part of the Revised Action Plan and to include residential, commercial, industrial, and institutional sector programs.

[22] The Treatment Plant Advisory Committee was created in 1959. The powers and duties of TPAC are to tender its advice with respect to any and all matters relating to the treatment plant and its maintenance, repair, expenses, replacement, improvement and operation, and policies relative thereto. TPAC meets monthly and the nine voting members are from San Jose, Santa Clara and tributary agencies. The tributary agencies include the cities of Milpitas, Cupertino, Campbell, Saratoga, Los Gatos, Monte Sereno, and the adjacent unincorporated areas.

[23] See page 43 for a description of the I & I Reduction Program.

Staff estimates that residential use is the largest component of wastewater, representing approximately 70 percent of the flows to the WPCP. The following programs represent the three residential Ultra Low Flow Toilet (ULFT) programs.

- ULFT Rebate Program: Aimed at single family dwellings, the program planned retrofit of 8,000 toilets per year in San Jose and 5,000 retrofits per year in the rest of the WPCP's service area.
- ULFT Voucher Program: Aimed at multi-family dwellings, the program offers a point-of-purchase discount on the purchase of ULFTs and provides free recycling services of old toilets to further reduce retrofit costs. It was estimated that there were 12,000 toilets that could be retrofitted in San Jose plus an additional 24,000 in the remainder of the service area.
- Community Partnership Program: This program provides free, installed ULFTs in "hard to reach" communities including low-income, elderly, and disabled residents. There were an estimated 30,000 possible retrofits remaining in San Jose and an additional 10,000 in the remainder of the service area.

The ULFT program also included programs for commercial, industrial and public institutions:

- Commercial/Industrial Voucher Program: This program is similar to the residential ULFT program.
- ULFT Retrofit for Public Schools and Other Facilities: ULFTs, and recycling of old toilets are provided for free.
- Installation is provided in some cases.

In 1997, ESD staff estimated the five-year Indoor Water Conservation Program would cost from $22 to $25 million and reduce flow to the WPCP by a total of 5 to 8 mgd. In the July 1999 Clean Bay Strategy Report, staff estimated that the residential program had reduced flows to the WPCP by 6.1 mgd since 1992, and the commercial program had reduced flows 0.9 mgd since 1991, for a total diversion of 7 mgd.

According to the ESD, the City spent $7.9 million in capital costs on Indoor Water Conservation Programs during 1997-98 and 1998-99 (not including Santa Clara Valley Water District costs), and $1.2 million on estimated operating, staff and other program support costs during 1997-98 and 1998-99. ESD staff has been

unable to locate cost records for the program prior to 1997-98. It seems reasonable to assume that operating and staffing costs for 1991-1997 would have been at least $1.2 million. Using these estimates, we calculate the cost per mgd to date of the Indoor Water Conservation program as follows:

Exhibit 9 Estimated Cost Per MGD Of Indoor Water Conservation Programs As Of June 30, 1999

Description	Costs (In Millions)
Estimated capital budget costs[24]	$7.9
Operating and staffing costs 1997-98 and 1998-99	1.2
Estimated operating and staffing costs 1991 to 1997	1.2
Total	$10.3
Estimated Diversion	7 mgd
Estimated Cost Per MGD	$1.5

It should be noted that, according to ESD, the most cost-effective installations may already have been completed.

Expanded Water Recycling

Water reclamation was a major component of the 1991 South Bay Action Plan. SBWRP Phase I facilities include a diversion structure, transmission pump station, two remote booster pump stations, one reservoir and 60 miles of distribution pipeline. In October 1997, the transmission pump station and 20 miles of pipeline became operational. By July 1998, additional pipeline segments were complete and connected to the system. Completion of deferred infill pipeline segments in 1999-00 at a cost of $12 million was expected to divert an additional 5 mgd.

On March 23, 2000, staff reported to the City Council Transportation and Environment Committee, that near-term plans to increase demand by 10 mgd over the next six years by expanding the recycled water distribution system within San Jose, Santa Clara and Milpitas, and constructing 57 miles of pipeline and 3 reservoirs to reach 219 customers, would cost approximately $180 million.

Using cost estimates from several sources, we calculate the cost per mgd of the SBWRP as follows:

[24] Does not include Santa Clara Valley Water District (SCVWD) costs for ULFT rebates.

Exhibit 10 Estimated Cost Per MGD Of SBWRP As Of June 30, 2000 (Debt Service Not Included)

Description	Cost (In Millions)
Estimated Phase I Capital Budget costs	$140.8
Estimated operating, staffing, and other miscellaneous costs incurred to date	12.5
Estimated Phase I deferred infill costs	16.0
Near term projects (preliminary estimate)	180.0
Total	$349.3
Estimated Diversion	20 - 25 mgd
Estimated cost per MGD	$14.0 to 17.5 million per mgd

It should be noted that if Phase I had been able to achieve its original estimated diversion of 21.1 mgd at the original 1992-93 budgeted capital cost of $90.3, the cost would have been approximately $4 million per mgd.

Finally, if we treat previously expended SBWRP monies as sunk costs[25], the cost per mgd of the proposed $180 million expansion, which is estimated to divert 10 mgd, would be $18 million per mgd.

It should be noted that according to ESD, the department is considering several different expansion options that will be presented to the City Council in the near future.

Industrial Recycling And Reuse

The mission of the Industrial Recycle and Reuse Program is to ensure that Industrial users in the WPCP service area reduce the use of potable water, reuse their own wastewater, and/or use reclaimed water in their facilities to the largest extent possible. The project includes investigative research, pilot projects and a financial incentive program that will assist industrial users in implementing the use of recycled water in the manufacturing process. Specific projects at industrial facilities include purifying and reusing water on-site and/or using SBWRP water in manufacturing processes. The Flow Audit Program, which the City initiated in 1998, requires industrial users with flows over 100,000 gallons per day to complete an audit in accordance with the City's Flow Audit Protocol.

The Financial Incentives Program was designed to provide financial assistance in the form of rebates to businesses that implement practices, devices, and process changes that reduce

[25] Expenditures already incurred.

wastewater discharges to the WPCP. The 1997 Revised South Bay Action Plan proposed a total of $5 million for industrial recycling and reuse programs. The Plan projected that this program would divert 2 to 4 mgd at a cost of $1.2 to $2.5 million per mgd.

The July 1999 Clean Bay Strategy Status Report stated that industrial users' average flow was 9.68 mgd, down from 13.29 in 1996 for a total decrease of 3.61 mgd. However, we found that 1.5 mgd of the 3.61 mgd reduction is the result of fewer industrial companies in the WPCP service area. Thus, using staff estimates, the program has diverted an estimated 2.1 mgd.

Using staff estimates, we calculate the cost per mgd of the Industrial Recycle and Reuse program as follows:

Exhibit 11 Estimated Cost Per MGD Of The Industrial Recycle And Reuse Program

Description	Cost (In Millions)
Estimated capital budget costs	$5.0
Operating and staffing costs	$0.5
Total	$5.5
Estimated Diversion	2.1 mgd
Estimated cost per mgd	$2.6 per mgd

Inflow & Infiltration Reduction And Sewer Rehabilitation

Inflow and Infiltration (I&I) refers to stormwater and groundwater that enters the sanitary sewer collection system, increasing the wastewater flows conveyed to and treated at the WPCP. In general, I&I enters the collection system through defective pipe joints, cracks in pipelines and manholes, or illegal storm sewer cross-connections. The program utilizes a phased approach to: (1) identify and locate I&I sources in the service area; (2) perform cost-benefit analyses to prioritize and recommend repair and replacement projects; (3) conduct a pilot program prior to full implementation of sewer rehabilitation work; followed by (4) post-monitoring to evaluate program effectiveness.

In the past, I&I reduction has not been a top priority as the WPCP was deemed to have adequate capacity both in treatment and disposal. However, in 1997 staff assumed that I&I was in excess of 10 mgd and was a contributor to the WPCP exceeding 120 mgd ADWEF. Thus the Revised Action Plan initiated a five-year, tributary-wide program anticipated to achieve approximately 8 mgd of flow reduction at a preliminary cost

estimate of $16.1 million. In 1998, ESD recommended and the City Council approved a plan to accelerate and expand the I&I program at a cost of $29 million. However, staff subsequently determined that faulty meter readings were the reason for increasing dry weather flows, not I&I. As a result, ESD reduced the 2000-01 Proposed Capital Budget for I&I to $14.7 million. In our opinion, this is a perfect example of how faulty meter readings can result in poor capital budget decision making (See Finding I).

Nonetheless, it should be noted that in 1999-00, the City completed one I&I project at a cost of $1 million that resulted in a 1 mgd reduction in dry weather I&I. Further, I&I projects within the City and the tributary agencies will be reimbursed for I&I project costs that result in documented dry weather I&I reduction.

Using staff estimates of costs associated with the single I&I project to date, we calculate the cost per mgd of the Groundwater Inflow and Infiltration Reduction program as follows:

Exhibit 12 Estimated Cost Per MGD Of The Groundwater Inflow And Infiltration Reduction Program

Description	Costs ($ In Millions)
Estimated capital budget costs	$1.0
Operating and staffing costs	Unknown
Total	$1.0
Estimated Diversion	1 mgd
Estimated cost per mgd	$1.0 per mgd

Environmental Enhancement Pilot Projects

The South Bay Action Plan includes two environmental enhancement pilot projects: streamflow augmentation and wetlands creation. The objective of streamflow augmentation pilot projects is to enhance habitat and improve water quality in streams using recycled water. Current summer stream flows and water quality in Santa Clara Valley rivers are insufficient to support healthy populations of cold-water species including Steelhead trout (proposed for federal listing as a threatened species) and fall-run Chinook salmon (likely to be proposed for listing). The City's pilot projects, with comprehensive monitoring programs, will assess the positive and negative impacts of discharging reclaimed water into local streams. These projects would not only use substantial amounts of

reclaimed water, they could potentially allow the Santa Clara Valley Water District to save potable water in its reservoirs that it might otherwise be required to release into the Guadalupe and Coyote Rivers to augment summer river levels.

In 1998, the City began planning a pilot project that would eventually discharge up to 8 mgd of recycled water into the Guadalupe River. Research revealed two major problems: (1) water temperature reduction would be required and (2) the flow might attract fish to an inhospitable location. As a result, the Guadalupe project was put on hold while the Coyote Creek project moved forward. The Coyote Creek project is currently in the planning and permitting phase for potential release of recycled water into Coyote Creek during the summer of 2001. It is projected to use approximately 10 mgd of reclaimed water.

Since this is a pilot project, the ESD has been working with many stakeholders (including the Santa Clara Valley Water District and various environmental groups) to determine exact locations and flow levels. The process has been difficult and many factors have been and will continue to be reviewed including temperature of the stream, types of fish in the stream, habitat in the stream, and location and type of groundwater aquifers. The ESD will be going to the Regional Water Quality Control Board for a permit later this year. Once the City has the permit, the ESD will be able to determine the new schedule and flow estimates, and will propose budget modifications accordingly.

According to the 2000-01 Proposed Capital Budget, streamflow augmentation is the most cost effective effluent diversion project. The 2000-01 Capital Improvement Program includes $8.5 million for this project. According to staff, $2.4 million was budgeted for each of these pilot projects, with the remainder earmarked for wetlands creation. We calculate the cost per mgd of the Streamflow Augmentation Program as follows:

Exhibit 13 Estimated Cost Per MGD Of The Streamflow Augmentation Program

Description	Cost ($ In Millions)
Estimated capital budget costs	$4.8
Operating and staffing costs incurred to date	$0.3
Total	$5.1
Estimated Diversion	18 mgd
Estimated cost per mgd	$0.3 per mgd

The proposed wetlands creation pilot project would use reclaimed water to create wetlands. The benefits of wetland creation include aesthetic value, habitat enhancement, and public education. A typical constructed wetland consists of a series of ponds of varying depth and plant growth. Staff estimate that a 40 acre wetland on WPCP property could accommodate 8 mgd of recycled water at a projected cost of $4 million[26]. According to the 1999 Clean Bay Strategy Status Report, this project will be developed more fully once stream flow augmentation has proven successful.

Like the Streamflow Augmentation Program, the Wetlands Creation Program could be extremely cost-beneficial to the City. We calculate the cost/benefit of the Wetlands Creation Program on WPCP property as follows:

Exhibit 14 Estimated Cost Per MGD Of The Wetlands Creation Program

Description	Cost ($ In Millions)
Estimated capital budget costs*	$4
Operating and staffing costs	To be determined
Total	$4
Estimated Diversion	8 mgd
Estimated cost per mgd	$0.5 per mgd

* Assumes project built on WPCP property

To the extent that staff can clear regulatory hurdles and make these pilot programs work, the City would clearly benefit.

[26] Staff estimate excludes land acquisition costs.

The City Should Target Future Flow Diversion Programs To The Most Cost Beneficial Alternatives

The above cost per mgd calculations do not take into account the economic benefit of reducing influent to WPCP. For example, ULFTs use only 1.6 gallons per flush (gpf) or less, compared with their 6 to 7 gpf predecessors. Thus, ULFTs reduce water use by at least 3.4 gpf, or 68 percent. As a result, flows are permanently reduced from what they would have been absent installation of the water conservation devices.

To estimate the economic impact of these reduced flows, we relied on ESD staff estimates that it would cost from $80 to $120 million to add 20 to 40 mgd of capacity to the WPCP, or $2 to $6 million per mgd. For comparison purposes in this report, we use the figure of $4 million per mgd to estimate avoided WPCP expansion costs (all figures are in current dollars).

In other words, by reducing the amount of water entering the wastewater system, San Jose avoids or defers considerable WPCP expansion costs. In our opinion, the cost/benefit of these programs is extremely favorable and the City would clearly benefit from installing additional ULFTs.

As shown above, our analysis reveals that those projects which divert wastewater flows from entering the WPCP are by far the most cost-beneficial of the South Bay Action Plan alternatives. Specifically, the indoor water conservation (ULFT) program, the industrial recycling and reuse program, and the inflow and infiltration projects all yield more in benefits than they cost if we take avoided costs into account. Exhibit 15 summarizes our calculations.

Exhibit 15 Summary Of Re-Calculated Costs And Benefits Of South Bay Action Plan Alternatives (Including Avoided WPCP Expansion Costs)

Project	Project Costs (In Millions)	Avoided WPCP Expansion Costs (In Millions)	Projected Diversion	Cost (Cost Avoided) Per MGD (In Millions)
Inflow/Infiltration Projects	$1.0	($4.0)	1.0 mgd	($3.0)
Indoor Water Conservation	$10.3	($28.0)	7.0 mgd	($2.5)
Industrial Recycling/Reuse	$5.5	($8.4)	2.1 mgd	($1.4)
Streamflow Augmentation	$5.1		18.0 mgd	$0.3
Wetlands Creation	$4.0		8.0 mgd	$0.5
Expanded Water Recycling	$180.0		10.0 mgd	$18.0

Clearly, expansion of the SBWRP is far more expensive and far less cost effective than the other alternatives in the South Bay Action Plan. In fact, the 1997 Revised South Bay Action Plan noted that the SBWRP was *"more capital-intensive . . . and . . . much less cost-effective than the others."*[27] [Emphasis added.] Nonetheless, the analysis concluded that not going forward with the project would have a detrimental impact on the economy of Santa Clara County.

In our opinion, the ESD should provide information on alternative strategies to the City Council before proceeding with the extension of the SBWRP. Complete cost information will allow the City Council to consider the cost-benefit of proposed flow-reduction projects, and target future programs to the most cost-beneficial alternatives while meeting its flow-reduction targets.

[27] "Others" refers to the other elements of the South Bay Action Plan.

We recommend that the ESD:

Recommendation #4

Provide the City Council with information on alternative flow-reduction strategies before proceeding with a proposed expansion of the South Bay Water Recycling Project.

ESD Should Track Operating Budget Costs Of Flow-Reduction Programs

We also found that although the ESD tracks capital costs for the various flow-reduction programs by project and compares them to budget, it does not always track and accumulate operating budget costs for these projects. In moving forward with flow-reduction programs, it will be important for the ESD to provide the City Council with complete information on what diversion programs have actually cost to date. This will provide the City Council with better cost information and provide ESD staff with the ability to better estimate costs of future flow-reduction programs.

We recommend that the ESD:

Recommendation #5

Track and accumulate operating budget costs for all flow-reduction programs in the South Bay Action Plan.

ESD Should Provide Cost-Benefit Information To The City Council

In our opinion, it is also extremely important that staff provide the City Council with comprehensive financial information about the various flow-reduction programs. In the past, the semi-annual Clean Bay Strategy report has focused on updating the City Council, regulatory agencies, and environmental groups on the City's progress with water diversion programs. Such reporting has not included comprehensive financial information about the different programs.

Comprehensive financial information would include 1) budgeted costs, 2) actual costs to date, 3) projected remaining costs, 4) projected diversion in mgd, 5) actual diversion in mgd, 6) projected remaining diversion capacity in mgd, 7) budgeted costs per mgd, 8) actual costs per mgd, and 9) projected final costs per mgd.

In our opinion, the City Council needs sufficient financial and environmental benefit information to be assured that the City is reducing flows in the most cost-effective and beneficial manner.

We recommend that the ESD:

Recommendation #6

Include a cost-benefit and environmental-benefit analysis of South Bay Action Plan alternatives in its annual reports to the City Council including (1) budgeted costs, (2) actual costs to date, (3) projected remaining costs, (4) projected diversion in mgd, (5) actual diversion in mgd to date, (6) projected remaining diversion capacity in mgd, (7) budgeted costs per mgd, (8) actual costs per mgd, and (9) projected final cost per mgd.

CONCLUSION

Our review revealed that the SBWRP is by far the least cost beneficial of South Bay Action Plan alternatives that are available to reduce WPCP effluent flows to San Francisco Bay. This summer, the ESD will release a report and recommendation for near-term and long-term SBWRP system expansion to the City Council. In our opinion, the ESD should provide the City Council with cost-benefit information on all long-range South Bay Action Plan alternatives prior to proceeding with the expansion of the SBWRP. In addition, the ESD should track and accumulate operating costs for all flow-reduction programs so that ESD staff will be better able to estimate future flow-reduction program costs. Finally, the ESD should provide the City Council with cost-benefit information for all flow-reduction alternatives.

RECOMMENDATIONS

We recommend that the ESD:

Recommendation #4 **Provide the City Council with information on alternative flow-reduction strategies before proceeding with a proposed expansion of the South Bay Water Recycling Project. (Priority 3)**

Recommendation #5 **Track and accumulate operating budget costs for all flow-reduction programs in the South Bay Action Plan. (Priority 3)**

Recommendation #6 **Include a cost-benefit and environmental-benefit analysis of South Bay Action Plan alternatives in its annual reports to the City Council including (1) budgeted costs, (2) actual costs to date, (3) projected remaining costs, (4) projected diversion in mgd, (5) actual diversion in mgd to date, (6) projected remaining diversion capacity in mgd, (7) budgeted costs per mgd, (8) actual costs per mgd, and (9) projected final cost per mgd. (Priority 3)**